Assessment of the seasonal forecast for the winter season 2012/13 in Bulgaria

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1. Introduction

1.1 Regular seasonal forecast

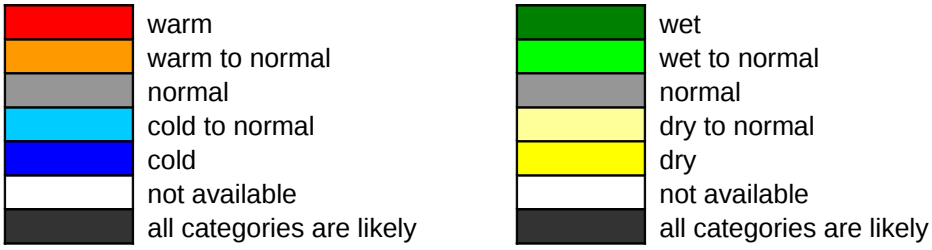
The National institute of meteorology and hydrology (NIMH) is the national weather service of Bulgaria. We have been producing regular seasonal forecast for our country since 2005. It is updated once a month at the end of the month as soon as all forecast materials become available. It is based on subjective analysis of the map products from the numerical climate prediction models of the following centers:

European center for medium range weather forecast, Reading, UK;
MetOffice, Exeter, UK;
National center for environmental prediction, USA;
International research institute, Columbia University, USA;
Beijing climate center, China;
Tokyo climate center, Japan;

and the statistical prediction models of the Italian institute of biometeorology Ibimet and the Tokyo climate center. All these materials are available on the websites of the centers.

1.2 Explanations

The categories “above normal”, “around normal”, and “below normal” by definition have an equal probability of occurrence of 33.3%. The aim of the seasonal forecast is to favor one or two of the three categories based on the analysis of all available forecast materials and assessment of the evolution of large climate structures for the upcoming months. We consider Bulgaria as a region that is relatively small compared to the spatial uncertainties of the modern seasonal forecasting materials. That is why we give a unique forecast valid for the entire country without detailing for different regions except occasionally and only for the first month based on analysis of the medium range weather forecast. The forecast is summarized in tables with the favored categories in color as follows:



We call “season” any three-month period which corresponds to the way the numerical seasonal forecast products are provided by the centers. However since 2011 the seasonal forecast is published only for the calendar season winter, spring, summer, and autumn.

The regular seasonal forecast is available to the public on the website of the institute (http://www.meteo.bg/en/node/58) though only in Bulgarian language.

2. Verification of the forecast for winter 2012/13

In order to quantify the seasonal forecast in terms of categories below, around, and above normal we do the following. Since we give a unique forecast for the expected category for the entire country we need to have a unique assessment of the category of a given month or season. The assessment of the category is based on data from 20 meteorological stations distributed evenly in the country. The data from each of those 20 stations are analyzed. These are records of mean monthly temperature and monthly amount of precipitation from 1950 to present. The percentiles for below, around, and above normal are found for each station based on the latest possible 30-year period 1980-2009. This period is chosen in order to match the base periods of some if not all of the climate centers producing probability map. This reference period is also more suitable to give monthly or seasonal category that would correspond better to the perception of the public. This should be especially true for the thermal category because of the recent overall warming trend. The months and seasons therefore can be attributed a certain category numbered from -2 (below normal) to +2 (above normal). These numbers for all 20 stations and for each individual month or season are then averaged in order to produce a unique category number for the entire country. The forecast itself is also attributed a number that reflects the forecast category. The numbers are -2 (below normal), -1 (below or around normal), 0 (around normal), +1 (above or around normal), and +2 (above normal). In order to assess the skill of our forecast we find the difference between the forecast and the real category. If it is within ±0.5 we consider that the forecast is excellent (4), within ±1.0 – very good (3), within ±1.5 – good (2), and above it is considered to be poor (0). If there is no given preference to any of the three categories we attribute score (1) reasonable, because at least the forecast is not misleading.

Table 1 and 2 show the regular Bulgarian seasonal forecast for the winter season DJF 2012/13 issued in September (Month-3), October (Month-2), and November (Month-1) 2012 and for the individual months of the winter season issued back to 3 months before the forecast one. The column “Index” gives the assessment of the month or the season based on real data.

Table 1: Score of the seasonal forecast of mean seasonal temperature for the winter season 2012/13 in Bulgaria.

	Forecast				Score		
Temperature	Month-1	Month-2	Month-3	Index	Month-1	Month-2	Month-3
December	0	0	0	-1.29	2	2	2
January	1	1	0	0.73	4	4	3
February	0	1	1	1.47	2	4	4
Winter	1	1	1	0.69	4	4	4

Table 2: Score of the seasonal forecast of seasonal amount of precipitation for the winter season 2012/13 in Bulgaria.

	Forecast				Score		
Precipitation	Month-1	Month-2	Month-3	Index	Month-1	Month-2	Month-3
December	1	1	0	1.63	3	3	0
January	-1	-1	0	0.59	0	0	3
February	1	-1	0	1.63	3	0	0
Winter	0	0	0	1.83	0	0	0

In average the forecast for temperature scores 3.25 which is very good and there is no bad or misleading forecast. The seasonal precipitation amount forecast in average scores 1.0 which is reasonable. This is thanks to four out of 12 very good hits. However the rest is not good. The monthly forecast improves as the month approaches except for January. The seasonal forecast for precipitation scores bad but it should be said that it is not misleading. Originally the ECMWF forecast was for rather dry season but we opted for rather normal or unpredictable one. Forecast for dry season would have been misleading.

This winter our national seasonal forecast followed the SEECOF-8 guideline and the discussions above apply for the regional forecast as far as it concerns Bulgaria.

Since 2012 the forecast contains additional measure that predicts how the upcoming season or month Is expected to compare to the same one from the previous year. This winter it was said that winter 2012/13 should be warmer and less wet than winter 2011/12. Sine winter 1011/12 was very cold and this winter was rather warm the comparative temperature forecast scores excellent. However the comparative precipitation forecast scores bad because this winter was actually wetter than the last one.

Figure 3: Departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for Jwinter (December-January-Februarry) 2012/13.

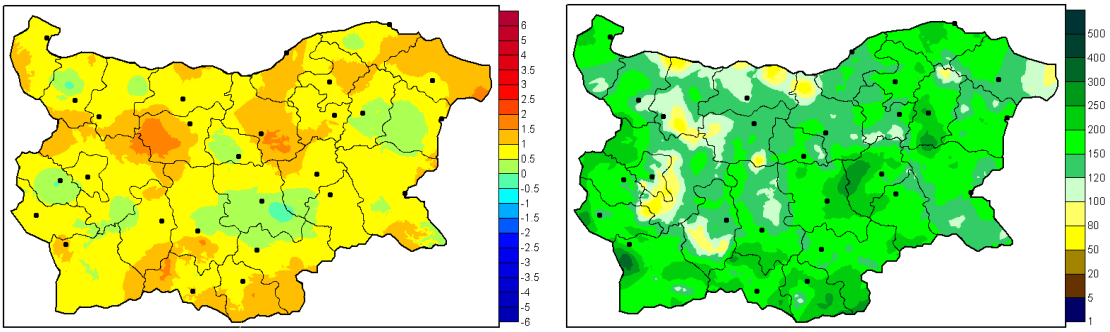


Figure 3, 4, 5, and 6 show maps of the departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for the winter season as a whole (Fig. 3) and the individual months of December 2012 (Fig.4), January 2013 (Fig.5), and February 2013 (Fig.6). The maps are regular operational products of the Bulgarian weather service and are therefore

given with reference to norms based on the period 1961-1990 as with the WMO recommendations.

Figure 4: Departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for December 2012.

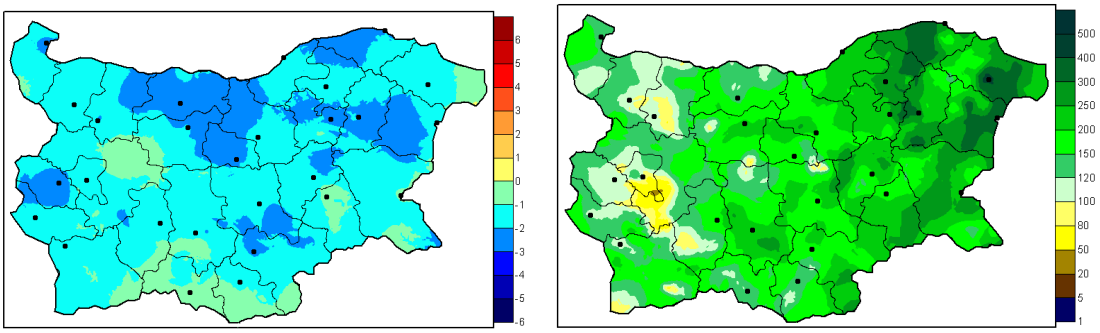


Figure 5: Departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for January 2013.

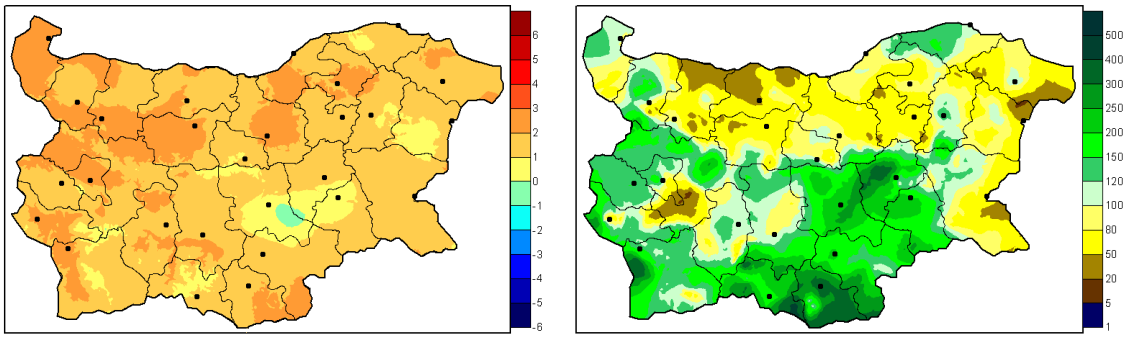
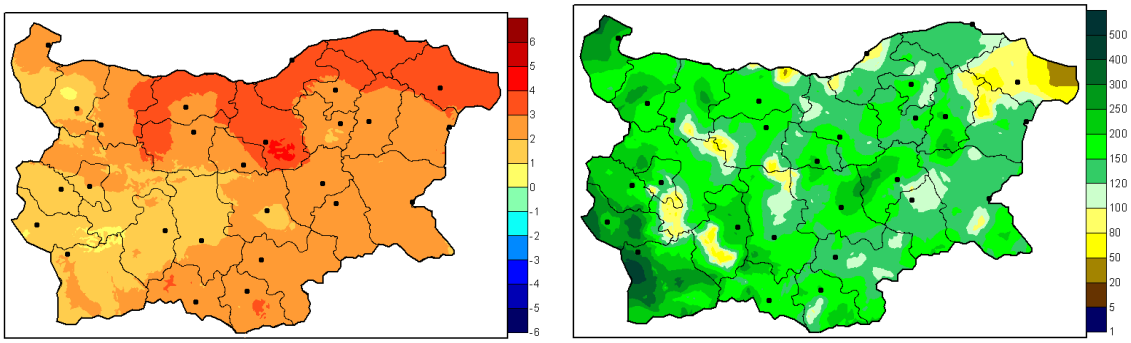


Figure 6: Departure of the monthly mean temperature from the norm (1961-1990) (left) and monthly amount of precipitation in percent of normal (1961-1990) (right) for February 2013.



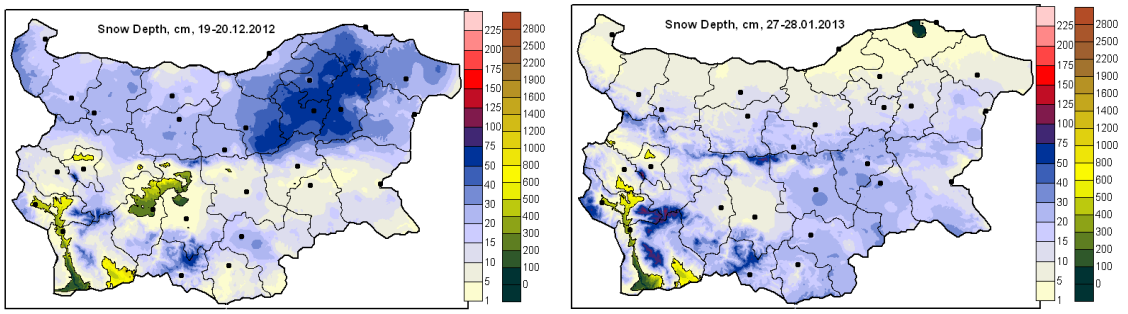
3. Extreme events

The month of December 2012 is the coldest for the last 11 years. The months of January and February 2013 are the warmest for the last 6 years. The winter season as a whole is the warmest for the last 4 years.

The month of December 2012 is the wettest for the last 22 years. The months of January and February 2013 and the winter season as a whole are the wettest for the last 3 years.

The most severe winter time was around 20 December 2012 when there was a blizzard in northeastern Bulgaria where the snow depth reached 50-80 cm. The snow cover in January and February was rather less than normal. Figure 7 shows the snow depth at its strongest for December (left) and January (right).

Figure 7: Snow depth (cm) on 20.12.2012 (left) and 27-28.01.2013 (right). Left scale - snow depth (cm); right scale – altitude (m) for the places without snow.



References:

Monthly bulletin of the National institute of meteorology and hydrology, Sofia, Bulgaria. Latest issue available online (http://www.meteo.bg/sites/storm.cfd.meteo.bg.meteo/files/Bulletin.pdf) and older issues available on demand.

Seasonal forecast fo Bulgaria. Latest issue available online (http://www.meteo.bg/en/node/58).